

Patent Claims

What is claimed is:

1. An externally-powered prosthesis mechanism usable with persons with amputations at or proximal to the level of the metacarpophalangeal joint, as well as persons with high-level amputations, said prosthesis mechanism comprising:

 a grasping mechanism including at least one mechanically operable finger member and at least one mechanically operable thumb member kinematically linked to said finger member such that said grasping mechanism is disposed in respective opened and closed configurations when said finger member is respectively moved away from and toward said thumb member; and

 a drive system extending tangentially with respect to said grasping mechanism, said drive system including a motor operatively connected to drive at least one planetary gear stage, said planetary gear stage being operatively connected to drive said grasping mechanism to said opened configuration when said motor is driven in a first direction and further drive said grasping mechanism to said closed configuration when said motor is driven in a second opposite direction.

2. A prosthesis mechanism according to claim 1, wherein said planetary gear stage includes at least one input and at least one output planetary gear stage, said motor is operatively connected to drive said input planetary gear stage, said input planetary gear stage is operatively connected to drive said output planetary gear stage, said output planetary gear stage being operatively connected to drive said grasping mechanism to said opened configuration when said motor is driven in said first direction and further drive said grasping mechanism to said closed configuration when said motor is driven in said second opposite direction.

3. A prosthesis mechanism according to claim 2, wherein said input planetary gear stage is disposed within a drive housing including an axle integrally formed thereon, said finger member includes an integrally formed sleeve rotatably disposed on said axle to thereby enable pivotal movement of said finger member about said axle by means of said input planetary gear stage.

4. A prosthesis mechanism according to claim 3, further comprising a TEFLO bearing disposed between said sleeve and said axle.

5. A prosthesis mechanism according to claim 3, wherein said output planetary gear stage is disposed tangentially with respect to said sleeve to thereby enable pivotal movement of said finger member by means of said output planetary gear stage being driven by said input planetary gear stage.

6. A prosthesis mechanism according to claim 2, further comprising a backlock assembly disposed between said input and output planetary gear stages, said backlock assembly including a casing having a carrier and cam assembly disposed therein, said cam being rotatable in a predetermined direction to wedge at least one roller against an interior wall of said casing to limit rotation of said finger and thumb members.

7. A prosthesis mechanism according to claim 2, wherein said input and output planetary gear stages include a generally common central axis.

8. A prosthesis mechanism according to claim 2, wherein said motor includes a drive shaft, said input and output planetary gear stages and said drive shaft include a generally common central axis.

9. A prosthesis mechanism according to claim 2, wherein said input planetary gear stage includes three planetary gear stages, each of said gear stages including three planet gears operatively driven by said motor to generate a pinch force of at least 5 lbsf between said finger member and said thumb member.

10. A prosthesis mechanism according to claim 2, wherein said input planetary gear stage includes three planetary gear stages, each of said gear stages including three planet gears operatively driven by said motor to generate an opening/closing speed of at least 2 rads/sec for said finger and thumb members.

11. A prosthesis mechanism according to claim 1, further comprising electrodes connected to said motor at one end thereof, the other end of said electrodes being operatively connected to a control system for opening/closing said grasping mechanism using electromyographic sites on a person.

12. A prosthesis mechanism according to claim 1, further comprising a covering of aesthetically acceptable material having an appearance generally similar to that of a normal hand.

13. A prosthesis mechanism according to claim 1, wherein said grasping mechanism is made of metal.